CLAIMS

1. A display apparatus comprising:

a pixel including a plurality of sub-pixels capable of representing a plurality of gradation levels; and

a driver which receives an input data, and outputs a plurality of data signals to said pixel based on said input data to control said plurality of sub-pixels,

wherein when a first sub-pixel of said plurality of sub-pixels represents one of a minimum gradation level and a maximum gradation level of said plurality of gradation levels, a second sub-pixel of said plurality of sub-pixels adjacent to said first sub-pixel represents other than the other of said minimum gradation level and said maximum gradation level.

2. The display apparatus according to claim 1, wherein said plurality of sub-pixels carries out gradation representation by using two gradation levels of a first gradation level of said plurality of gradation levels and a second gradation level of said plurality of gradation levels at a time.

3. The display apparatus according to claim 2, wherein said first gradation level is different by one level from said second gradation level.

4. The display apparatus according to claim 2, wherein said driver comprises:

a gradation voltage generator which receives a first set of bits in said input data, and generates a first gradation voltage corresponding to said first gradation level and a second gradation voltage corresponding to said second gradation level based on said first set of bits; and

a selector which receives a second set of bits in said input data together with said first gradation voltage and said second gradation voltage generated by said gradation voltage generator, and selects one of said first gradation voltage and said second gradation voltage to be sent to each of said plurality of sub-pixels as one of said plurality of data signals based on said second set of bits.

5. The display apparatus according to claim 2, wherein said driver comprises a gradation voltage generator which receives a first set of bits in said input data, generates a first gradation

voltage corresponding to said first gradation level and a second gradation voltage corresponding to said second gradation level based on said first set of bits, and outputs said first gradation voltage and said second gradation voltage as said plurality of data signals, and

each of said plurality of sub-pixels comprises a selector which receives a second set of bits in said input data together with said first gradation voltage and said second gradation voltage outputted from said gradation voltage generator, and selects one of said first gradation voltage and said second gradation voltage based on said second set of bits.

6. The display apparatus according to claim 4, wherein said driver further comprises:

an input signal interchange unit which receives said input data and selects one of a first mode and a second mode of gradation representation; and

a memory which stores a plurality of bits of data,

wherein in said first mode, said input signal interchange unit outputs a third set of bits in said input data to said gradation voltage generator and a fourth set of bits in said input

data to said memory, and said memory outputs said fourth set of bits to said selector, and

in said second mode, said input signal interchange unit outputs a fifth set of bits in said input data to said gradation voltage generator and a sixth set of bits in said input data to said memory, and said memory outputs said sixth set of bits to said selector.

7. The display apparatus according to claim 5, wherein said driver further comprises:

an input signal interchange unit which receives said input data and selects one of a first mode and a second mode of gradation representation; and

a memory which stores a plurality of bits of data, wherein

in said first mode, said input signal interchange unit outputs a third set of bits in said input data to said gradation voltage generator and a fourth set of bits in said input data to said memory, and said memory outputs said fourth set of bits to said selector provided for said each of said plurality of sub-pixels, and

in said second mode, said input signal interchange unit outputs a fifth set of bits in said input data to said gradation voltage generator

and a sixth set of bits in said input data to said memory, and said memory outputs said sixth set of bits to said selector provided for said each of said plurality of sub-pixels.

8. The display apparatus according to claim 7, wherein said pixel further comprises a calculator which receives said sixth set of bits outputted from said memory, performs a calculation based on said sixth set of bits, and outputs a calculation result to at least one of said plurality of sub-pixels.

9. The display apparatus according to claim 4, wherein said driver further comprises an input signal converting unit which receives said input data, outputs a quotient obtained by dividing said input data by a natural number to said gradation voltage generator, and outputs a residual obtained by dividing said input data by said natural number to said selector.

10. The display apparatus according to claim 4, wherein said driver further comprises:

an input signal converting unit which receives said input data and selects one of a first

mode and a second mode of gradation representation; and

a memory which stores a plurality of bits of data, wherein

in said first mode, said input signal converting unit outputs a quotient obtained by dividing said input data by a natural number to said gradation voltage generator, and outputs a residual obtained by dividing said input data by said natural number to said memory, and said memory outputs said residual to said selector, and

in said second mode, said input signal converting unit outputs a sixth set of bits in said input data to said memory, and said memory outputs said sixth set of bits to said selector.

11. The display apparatus according to claim 5, wherein said driver further comprises:

an input signal converting unit which receives said input data and selects one of a first mode and a second mode of gradation representation; and

a memory which stores a plurality of bits of data, wherein

in said first mode, said input signal converting unit outputs a quotient obtained by dividing said input data by a natural number to

said gradation voltage generator, and outputs a residual obtained by dividing said input data by said natural number to said memory, and said memory outputs said residual to said selector provided for said each of said plurality of sub-pixels, and

in said second mode, said input signal converting unit outputs a sixth set of bits in said input data to said memory, and said memory outputs said sixth set of bits to said selector provided for said each of said plurality of sub-pixels.

12. The display apparatus according to claim 2, wherein said driver divides said input data into m frames of data, and scans each of said plurality of sub-pixels m times to represent said first gradation level p times and said second gradation level q times, wherein said p and said q are integers equal to or more than 0, said m is equal to a sum of said p and said q, and values of said p and said q depend on said each of said plurality of sub-pixels.

13. The display apparatus according to claim 3, wherein said driver divides said input data into m frames of data, and scans each of said plurality of sub-pixels m times to represent said first gradation level p times and said second gradation

level q times, wherein said p and said q are integers equal to or more than 0, said m is equal to a sum of said p and said q, and values of said p and said q depend on said each of said plurality of sub-pixels.

14. The display apparatus according to claim 4, wherein said driver divides said input data into m frames of data, and scans each of said plurality of sub-pixels m times to represent said first gradation level p times and said second gradation level q times, wherein said p and said q are integers equal to or more than 0, said m is equal to a sum of said p and said q, and values of said p and said q depend on said each of said plurality of sub-pixels.

15. The display apparatus according to claim 1, wherein a number of said plurality of sub-pixels is n (n is an integer equal to or more than 1), and an area ratio of said plurality of sub-pixels is $1:2^1:2^2:\cdots:2^{n-1}$.

16. The display apparatus according to claim 1, wherein a number of said plurality of sub-pixels is n (n is an integer equal to or more than 2), and an

area ratio of said plurality of sub-pixels is $1:1:2^1:2^2:\cdots:2^{n-2}$.

17. The display apparatus according to claim 13, wherein a number of said plurality of sub-pixels is n (n is an integer equal to or more than 2), and an area ratio of said plurality of sub-pixels is $1:1:2^1:2^2:\cdots:2^{n-2}$.

18. The display apparatus according to claim 13, wherein said plurality of sub-pixels have a same area.

19. A method of gradation representation in a display apparatus, comprising:

representing a plurality of gradation levels on a pixel including a plurality of sub-pixels; and

controlling said plurality of sub-pixels such that when a first sub-pixel of said plurality of sub-pixels represents one of a minimum gradation level and a maximum gradation level of said plurality of gradation levels, a second sub-pixel of said plurality of sub-pixels adjacent to said first sub-pixel represents other than the other of said minimum gradation level and said maximum gradation level.

20. The method of gradation representation according to claim 19, wherein said plurality of sub-pixels carry out gradation representation by using two gradation levels of a first gradation level of said plurality of gradation levels and a second gradation level of said plurality of gradation levels at a time.

21. The method of gradation representation according to claim 20, wherein said first gradation level is different by one level from said second gradation level.

22. The method of gradation representation according to claim 20, further comprising:

scanning each of said plurality of sub-pixels m times to represent said first gradation level p times and said second gradation level q times,

wherein said p and said q are integers equal to or more than 0, said m is equal to a sum of said p and said q, and values of said p and said q depend on said each of said plurality of sub-pixels.